Space Weather Forecast

Issued on Thursday 10 October 2024 at 01:30 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of strong class flares. Ongoing Moderate/Strong Solar Radiation Storm. Minor/Moderate geomagnetic storms expected, chance of Strong storms and slight chance of Severe storms days 1 and 2.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been at High levels with a Strong flare peaking at 09/0156 UTC from a spot near centre disk, and another Strong flare peaking at 09/1547 UTC from a region on the west limb, which also gave a Moderate class flare late in the day. There are currently eight sunspot regions visible. Of these, five regions are numbered, with three regions all magnetically complex and generally large in size, two of which issued the Strong flares. Of the remaining regions one is moderately magnetically complex and the rest small and magnetically simple.

A large material-rich full halo coronal mass ejection (CME) was observed leaving the Sun in association with the Strong flare and filament eruption early on 09 Oct. This coronal mass ejection has been analysed as arriving at Earth late 10 or early 11 Oct.

Another CME was seen leaving the Sun in association with the second Strong flare, but as the source region is on the west limb this CME is not expected to be Earth directed. Analysis will be undertaken to confirm this.

Solar Wind / Geomagnetic Activity: The period was indicative of waning coronal mass ejection and coronal hole high speed stream influence. Solar wind speed was mainly slightly elevated, generally between 400-450km/s, but temporarily decreased to background levels around 300 km/s for a time later in the day. The strength of the solar wind's magnetic Field, Bt, was initially Moderate but gradually declined to Weak levels. The north-south component favoured a southward orientation, and was predominantly Weak. Phi angle was predominantly positive (away from the Sun). Geomagnetic activity was Active to Minor Storm decreasing Quiet.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) was initially at background levels before responding to the Strong flare on 9th Oct,. The high energy protons rose to reach Strong storm levels.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is expected, with a chance of isolated Strong-class flares until day 2 (11 Oct). From then activity is then expected to decrease Low to Moderate, but with a slight

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chance of Strong-class flares. However, new or returning regions are likely to rotate onto the visible disc during the forecast period, and solar activity may increase again.

Solar Wind / Geomagnetic Activity: There are two coronal mass ejections which may glance Earth early today (10 Oct). A large full halo coronal mass ejection is then expected to arrive at Earth late today or early tomorrow (10/11 Oct).

Solar winds are currently slightly elevated, with a slight chance of increasing to elevated levels should any of the glancing coronal mass ejections have peripheral impacts at Earth from today (10 Oct). Late today (10 Oct) or early tomorrow (11 Oct), the full halo coronal mass ejection is expected to arrive, perhaps increasing wind speeds to strong. Solar wind speeds should then gradually decrease to slightly elevated levels through day 3 (12th) perhaps down to background levels for day 4 (13th).

Geomagnetic activity is expected to be Quiet to Unsettled initially with a chance of isolated Active to Minor storms intervals due to glancing coronal mass ejection's. Activity is then expected to increase later today or early tomorrow (10/11 Oct) due to the arrival of the full halo CME, bringing expected Minor-Moderate storms , a chance of Strong storms and a slight chance of Severe storms, with the peak of the activity weighted to tomorrow (11 Oct). Through day 3 (12 Oct) geomagnetic activity should begin to decline, becoming predominantly Quiet to Active, but with a chance of Minor Storms, due to any residual CME effects. Day 4 Quiet to Unsettled activity is likely, with perhaps a chance of Active intervals late in the day.

Aurora Forecast: Geomagnetic storms may bring a chance to view the aurora overnight on the 10th into the 11th, most likely across Scotland and Northern Ireland but possibly further south if conditions are favourable and where skies are clear.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) responded erratically to a strong flare and associated filament eruption. Moderate storm levels are being observed, but are not far below Strong storm levels. The high energy protons are likely to temporarily reach Strong storm levels at times, especially after further CME influence today and tomorrow. From day 3 (12th) levels are expected to gradually fall.

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Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	80	80	60	20
Strong	G3	No	40	50	20	1
Severe	G4	No	10	20	5	1
Extreme	G5	No	1	5	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 (M Class)	Yes	80	60	60	60
Very Active	R3-R5 (X Class)	Yes	30	20	10	10

Solar Radiation Storms (High Energy Protons)

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	95	60	30
Very Active	≥ S3 *	Yes	70	60	20	5
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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